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BRISTOL BAY KING, CHUM, PINK AND COHO SALMON, 1968

A COMPILATION OF CATCH AND ESCAPEMENT DATA

By:

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INTRODUCTION

This publication is the third in an annual series intended to present catch and escapement statistics for king, chum, pink and coho salmon fisheries of Bristol Bay. The Nushagak and Togiak areas are the only districts where major runs of salmon other than red salmon occur (Table 1). This report deals only with these two fishing districts, as the limited runs in the other three districts of Bristol Bay preclude efforts to sample there.

Personnel of the Alaska Department of Fish and Game, Division of Commercial Fisheries collected all data. The author furnished all scale readings and compiled the data in the form presented.

METHODS AND MATERIALS

The data in this report was collected by field crews stationed at counting towers and at selected canneries in the Nushagak and Togiak districts of Bristol Bay (Figure 1). Each sampling station was supplied with measuring calipers or tapes, weighing scales, appropriate forms and gum cards for scale collection. Scales were taken from each fish sampled (except pink salmon) and placed on gum cards and pressed to

form plastic impressions. Mid-eye to fork-tail lengths were recorded to the nearest millimeter and round weights to the nearest one-tenth of a pound.

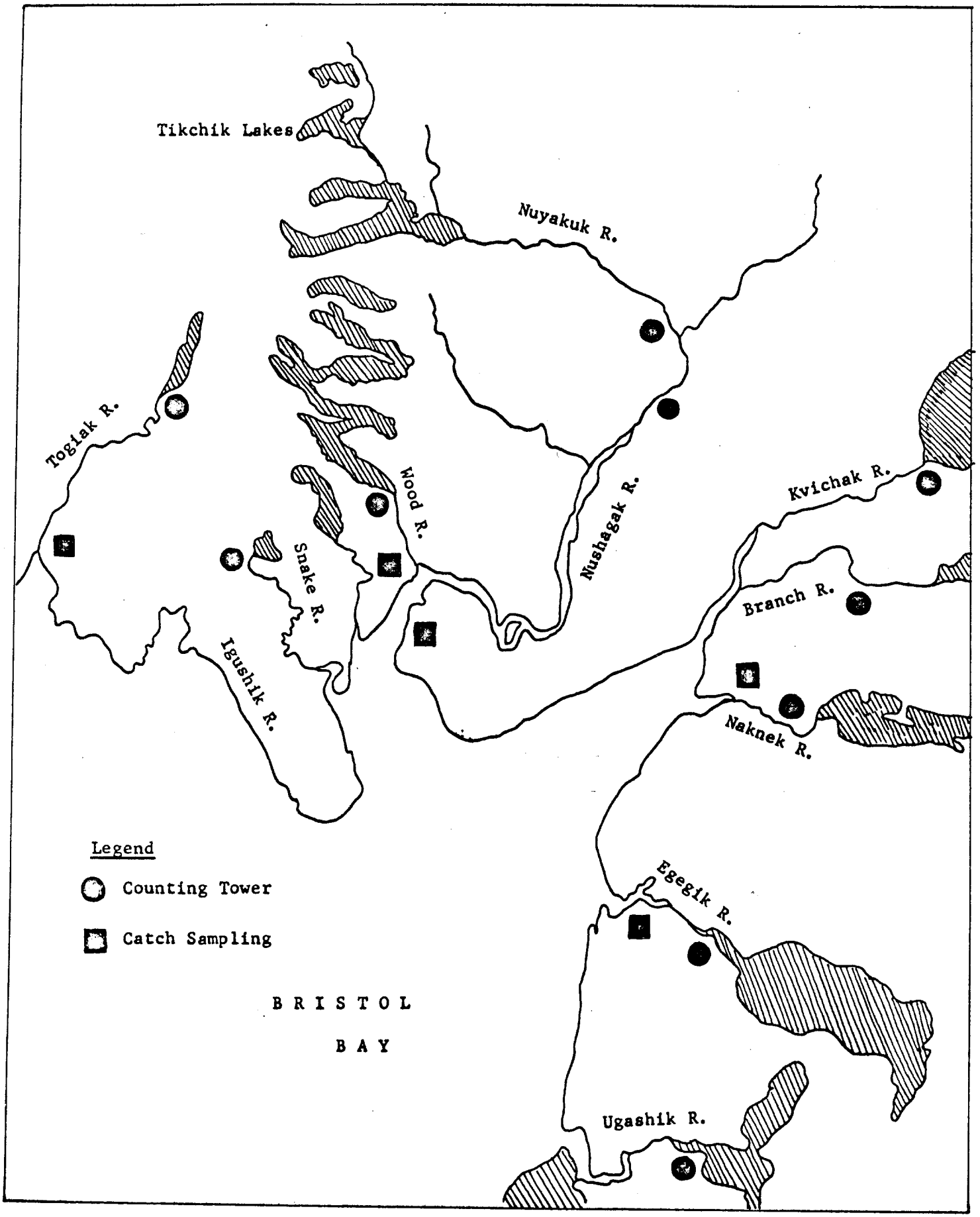
Catch Sampling

Catch sampling was conducted at the Pacific Alaska Fisheries cannery in the Nushagak district, and the Togiak Fisheries cannery in that district. The cannery fish samples were taken by removing fish randomly from conveyor belts as the fish moved into the cannery storage bins prior to processing. The only exception to the method of selecting samples was at Togiak where king salmon were randomly taken from the cannery docks as catches were delivered.

Statistical analysis of the absolute error incurred in the estimation of the proportion of a given age class of red salmon in Bristol Bay indicates that a minimum sample size of 150-200 fish per time period was required for each sex. Since considerable difference exists between the age composition of male and female salmon, particularly in the commercial catch, sampling requirements were set separately for the two sexes. Taking into account imbalances in the sex ratio, and illegible and missing scales, a sample size requirement of 600 fish per period was set for red salmon. The same general considerations apply to sampling of other species of salmon, and with this in mind, catch samplers were instructed to sample as many fish as possible, but not over 500 fish per species for each fishing period. The lower sample was justified as each sampler was required to sample several different species at one time. The Nushagak sampler was further instructed to concentrate his sampling efforts on the important king salmon fishery of that district, while the Togiak sampler obtained king and chum salmon

Figure 1

APPROXIMATE LOCATIONS OF CATCH SAMPLING AND COUNTING TOWERS
BRISTOL BAY, 1968



samples after first acquiring the required red salmon sample of 600 fish. In most cases the samples of king, chum, pink and coho salmon were below the required 500 fish per period, although most samples were considered to be adequate for the purposes intended.

Escapement Enumeration and Sampling

Escapement estimates of king and chum salmon were recorded at the Nushagak River counting tower (Tables 4-5) and on the Stuyahok River, a tributary of the Mulchatna River system, where a weir was employed to enumerate king and chum salmon (Tables 7-8). Escapement samples of chum salmon were gathered at the Stuyahok River field station (Tables 17-18), while the pink salmon escapement to the Nushagak district was enumerated and sampled at the Nuyakuk River counting tower (Tables 6 & 20). King and coho salmon escapement samples were not obtained in the Nushagak district, nor were any escapement samples obtained in the Togiak district in 1968.

Peak aerial survey escapement estimates were obtained for king salmon in the Nushagak district and for king, chum and coho salmon in the Togiak district, and are presented in Appendix Tables 1-3.

Table 2 lists the total estimated run by species in the Nushagak and Togiak districts. Escapement estimates as shown in Table 2, were derived by expanding aerial survey estimates as presented in Appendix Tables 1-3. The only exception to this method of deriving escapements was with the pink salmon escapement estimate, which was derived from actual tower counts on the Nuyakuk River. Explanation of the methods used to estimate escapements of the species is presented under the district headings.

TABLE 1. Summary of Bristol Bay final commercial catch, other than red salmon, by district and species, 1968.

District	Catch by Species				
	Kings	Chums	Pinks	Cohos	Total
Naknek-Kvichak	6,398	43,137	218,732	7,357	275,674
Egegik	3,472	16,193	211	6,507	26,383
Ugashik	2,153	17,624	0	5,771	25,548
Nushagak	78,201	178,786	1,705,150	48,867	2,011,004
Togiak	13,499	108,001	11,743	24,872	158,115
Totals	103,723	363,791	1,935,836	93,374	2,496,724
Percent Comp.	4.2	14.6	77.5	3.7	100.0

TABLE 2. Total estimated run by species, other than red salmon, Nushagak and Togiak districts, 1968.

Species	Catch	Escapement[1/]	Total Run[2/]
	NUSHAGAK DISTRICT		
Kings	78,201	60-80,000	138-158,000
Chums	178,786	90-110,000	269-289,000
Pinks	1,705,150	2,161,116	3,866,000
Cohos	48,867	-	-
	TOGIAK DISTRICT		
Kings	13,499	10-14,000	23-27,000
Chums	108,001	348,000	456,000
Pinks	11,743	-	-
Cohos	24,872	12-15,000	37-40,000

1/ Escapement estimate based on aerial survey of spawning grounds, except Nushagak district pink salmon, which is a tower count.

2/ Rounded to nearest thousand.

Fecundity and Weight

Samples of Nushagak district king salmon ovaries were obtained from the commercial catch during the course of the season in 1966 and 1968 (Appendix Table 5). Fish were selected three per 20 mm. grouping to insure a representative sample over the size range of the females. Associated data, including lengths, weights and scales for aging, were obtained from each fish sampled.

Egg skeins were hand tallied in 1966 using Veeder Root counters and a 100-hole egg board. This method proved time consuming and consequently, the 1968 samples were counted using an approved weight method.

Average weight by species as determined by weighting salmon throughout the season is presented in Appendix Table 4 for 1964 through 1968.

Objectives

It is the purpose of this report to present all available statistics in a form which will serve the needs of scientists concerned with these fisheries. No attempt will be made to draw conclusions or discuss the merits or shortcomings of the data collection procedures.

Remarks appropriate to each district are included with the data from that district.

Both the Gilbert-Rich and European age designations are used throughout this paper. In all age composition tables the European notation is placed over the Gilbert-Rich notation. All sex and age composition tables are weighted by the commercial catch or escapement, unless otherwise indicated. Length measurements of all catch and escapement samples were recorded, but not included in this paper. They are available upon request.

NUSHAGAK DISTRICT

The Nushagak fishery district boundaries in 1968 remained unchanged from 1967 (Figure 2). The Snake River section remained closed to fishing throughout the red salmon season, but was open for king salmon fishing prior to June 17. Table 3 shows the final commercial catch, other than red salmon, for 1968 by species and period.

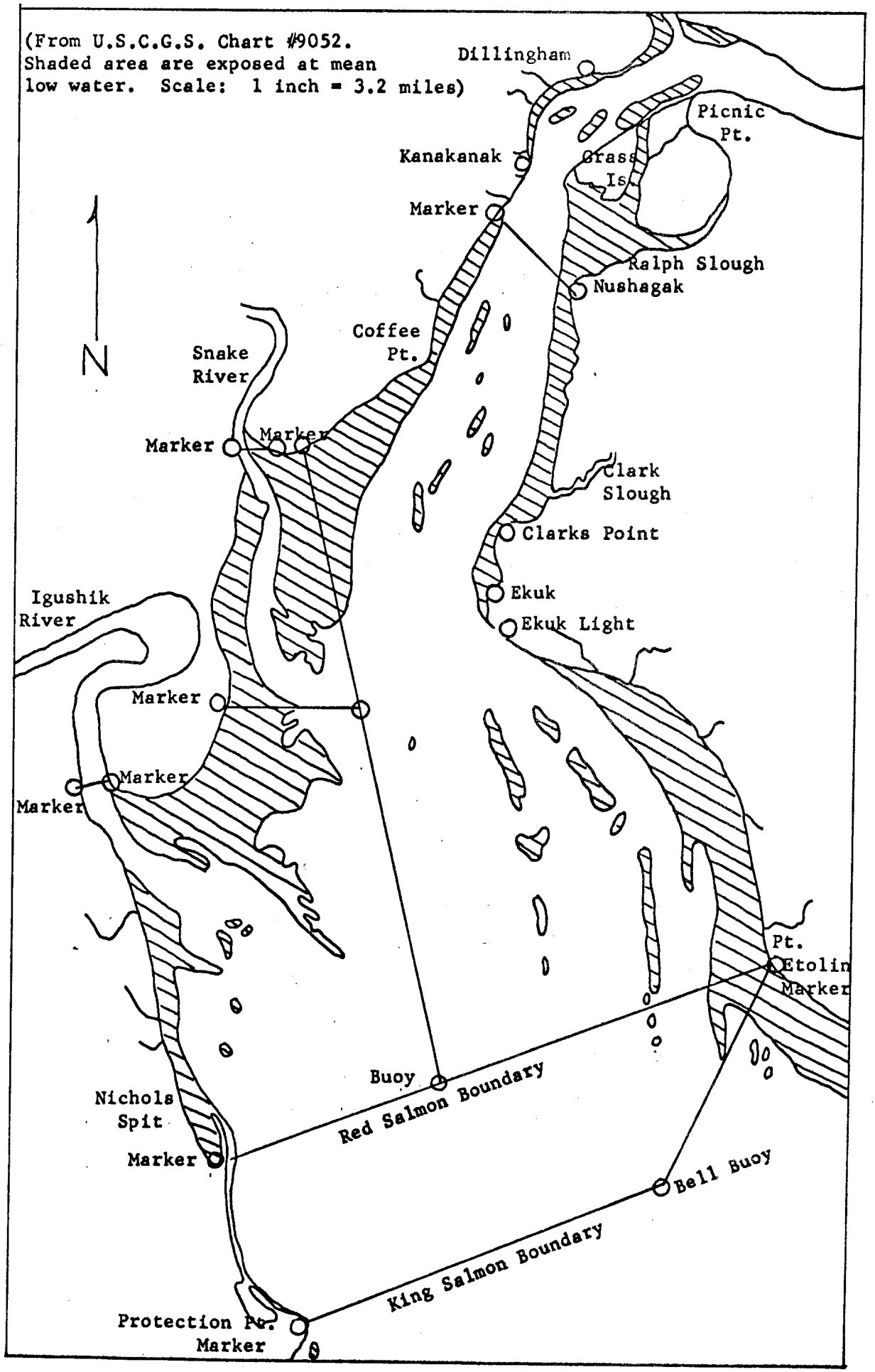
King Salmon

The 1968 king salmon run to the Nushagak district was estimated at 138,000 to 158,000 fish, with the catch accounting for an estimated 53 percent or 78,201. The total catch was the seventh highest in the last 18 years and was 18 percent higher than the average catch for this period (1951-1968).

Fishing effort was heavy on the king stocks with over 326 drift boats and 14 set nets participating in the fishery. Drift fishermen accounted for over 98 percent of the total king salmon catch, which is a normal occurrence in this district. The normal 150 fathoms of drift net and 50 fathoms of set net gear was reduced in 1968 to 75 fathoms for drifters and 25 fathoms for set netters in an attempt to discourage participation and reduce fishing effort in the fishery. Further, a minimum mesh size requirement of 7 inches stretch measure was in effect prior to June 21, which in effect, kept the smaller "red salmon" gear of 5-3/8 inches stretch measure out of the fishery until June 21. Most fishermen use 8 inch stretch measure nets in the Nushagak district.

There were three operating shore canneries processing salmon in 1968. Additionally, there were three freezer ships, one ship icing kings for the fresh market and one shore plant shipping fresh kings to Anchorage.

Figure 2. 1968 NUSHAGAK COMMERCIAL FISHING DISTRICT.



A weir was operated on the Stuyahok River in 1968 and a total of 5,150 king salmon were counted through the gate (Table 7). Subsequent aerial surveys of the Stuyahok River system provided an aerial estimate of 2,470, or 48 percent of the known total king population (Appendix Table 1). Care must be used in applying this ratio to other streams because of differing physical and climatic conditions. However, the Stuyahok project does indicate in general terms what a comprehensive aerial survey under ideal conditions can account for in terms of total spawning populations.

King salmon counted past the Nushagak River tower totaled 14,628, which was considered minimal because of the mid-stream migratory habits of king salmon and the lateness of the commencement of the counting tower operation (Table 4). Tower counts as shown in Table 4 peaked in numbers shortly after counting began on June 27. Further, upriver area residents report that normally kings began to appear in personal use catches in late May. The earliest reported upriver king salmon personal use catch was on May 20 in 1966. Upriver refers to the three major villages above the counting tower site. All sources indicate that a significant portion of the kings have already passed the tower site before it is operational. Experience and aerial survey observations at the tower have shown that even when counting is possible, the majority of the kings migrate in the middle section of the river and cannot be seen from the counting tower. To derive an estimate of the total escapement to the district as presented in Table 2, it becomes necessary to evaluate various data including: spawning grounds surveys, tower counts, and commercial and subsistence catches. The estimated total district king escapement of 60-80,000 was made after analysis

of all available data and is considered reasonable by the author (Table 2).

Tables 9 through 12 present sex and age composition of the 1968 king salmon commercial catch. Average weight of 558 fish sampled randomly throughout the season was 22.2 pounds. Appendix Table 4 presents average king salmon weights for 1964-1968, while Appendix Table 5 gives results of two king salmon fecundity studies conducted in the Nushagak district in 1966 and 1968. A review of the literature available on king salmon fecundity in various areas of North America shows that Nushagak king stocks have the highest recorded mean egg content in North America.

Chum Salmon

Chum salmon are taken concurrently with red salmon in the Nushagak district. The total catch of 178,786 was 18 percent lower than the average catch for the past 18 years (1951-1968). The total run was estimated to be approximately 269-289,000 (Table 2).

Escapement of chum salmon enumerated at the Nushagak River counting tower in 1968, was the highest in the three years of operation (Table 5). Because of the unusually low, clear water, good counting conditions throughout most of the season and the inshore migratory habits of chum salmon, the tower estimate of 72,244 was considered to more closely approximate the total chum spawning population than in the previous two years. Most probable total escapement to the district was estimated to be in the range of 90-110,000 (Table 2).

Table 13 through 16 present sex and age composition of the 1968 chum salmon commercial catch, while Tables 17 and 18 give the same data for chum samples collected at the Stuyahok River weir. These escapement samples were not collected from actively migrating fish,

rather the scales for age analysis were gotten from dead, spawned-out fish. The imbalance in the sex ratio of the escapement is probably due to the effects of the selective fishery. Table 13 shows that the present mesh size of 5-3/8 inch stretch measure is highly selective toward the female portion of the run.

Average weight of the commercial catch was 6.9 pounds in 1968, and is compared with previous years in Appendix Table 4.

Pink Salmon

The Nushagak pink salmon fishery, which peaks in late July, produced a catch of 1,705,150, the second largest since 1951.

In anticipation of the expected large run over 571 drift boats and 144 set nets participated in the fishery. Almost continuous fishing time from July 15 to August 10, when only one 24-hour period was closed to fishing, plus the relaxation of fishing gear restrictions on the Nushagak fleet was still not enough to adequately harvest the large pink return.

Pink salmon were enumerated and sampled at the Nuyakuk River counting station where the majority of the district escapement passes on their way to the spawning grounds in the upper portion of the Nuyakuk and Tikchik Rivers. Total observed escapement was 2,161,116 (Table 6). Catch and escapement combined provides an estimated total run of 3,866,266 pink salmon in 1968.

Tables 19 through 21 present sex composition of the 1968 catch and escapement. Average weight of 644 commercially caught pinks sampled throughout the season was 3.2 pounds (Appendix Table 4).

Coho Salmon

The catch of 48,867 coho salmon was the largest since 1958 and represents a 42 percent increase over the past 18-year average (1951-1968).

Limited data was collected from the 1968 coho commercial catch, and is not presented in this report. A summary of data collected shows:

1. Total season sample from the commercial catch was 144, of which only 84 fish had readable scales;
2. Age composition of the readable scales were:

1.1 / 3_2	2.8 percent
2.1 / 4_3	96.4 percent
2.2 / 5_3	0.8 percent

3. Sex ratio of the commercial catch was 46.5 percent males and 53.5 percent females;
4. Average weight of 129 cohos sampled during the early portion of the season was 7.6 pounds (Appendix Table 4);
5. Partial Nushagak River tower counts from August 2-9 was 6,612 cohos. Counts were terminated when water turbidity became too great to see.

Sex and age composition of the Nushagak district coho salmon commercial catch has shown very little difference for the three years the sampling program has been in exsistence.

TABLE 3. Nushagak district final commercial catch, other than red salmon, by species and period, 1968.

Period	Hours	Catch by Species				
		Kings	Chums	Pinks	Cohos	Total
5/31-6/1	2 days	4,922				4,922
6/3-8	5 days	6,828	1			6,829
6/10-15	5 days	25,389	66	2		25,457
6/17-18	24	9,491	319	1		9,811
6/21-22	24	15,810	8,195	8		24,013
6/25-26	26	3,524	28,420	15		31,959
6/28[1/]	12	498	786	7		1,291
6/30	12	6,353	58,292	30		64,675
7/2-3[1/]	12	260	165	3		428
7/4-7[1/]	66	1,491	3,372	36		4,899
7/8-13	5 days	2,493	48,422	5,671	10	56,596
7/15-20	5 days	706	16,006	600,231	2,410	619,353
7/21-27	7 days	327	14,118	823,537	14,662	852,644
7/28-8/3	7 days	79	330	254,633	9,671	264,713
8/4-10	6 days	21	231	20,156	13,092	33,500
8/12-17	5 days	9	63	820	7,204	8,096
8/19-24	5 days				1,249	1,249
8/26-31	5 days				272	272
9/2-7	5 days				252	252
9/9-14	5 days				45	45
Totals		78,201	178,786	1,705,150	48,867	2,011,004
Percent of district catch		3.9	8.9	84.8	2.4	100.0

1/ Igushik section only.

TABLE 4. Nushagak River final king salmon daily escapement counts, 1968.[1/]

Date	Daily Counts	Daily Percent of Total	Accumulated Counts
6/27	708	4.84	708
28	1,794	12.26	2,502
29	1,458	9.97	3,960
30	1,650	11.28	5,610
7/ 1	1,200	8.20	6,810
2	204	1.39	7,014
3	648	4.43	7,662
4	318	2.17	7,980
5	990	6.77	8,970
6	624	4.27	9,594
7	336	2.31	9,930
8	504	3.45	10,434
9	390	2.68	10,824
10	588	4.02	11,412
11	960	6.56	12,372
12	486	3.32	12,858
13	798	5.45	13,656
14	180	1.23	13,836
15	102	0.70	13,938
16	18	0.12	13,956
17	24	0.16	13,980
18	24	0.16	14,004
19	96	0.66	14,100
20	54	0.37	14,154
21	138	0.94	14,292
22	72	0.49	14,364
23	66	0.45	14,430
24	18	0.12	14,448
25	36	0.25	14,484
26	6	0.04	14,490
27	18	0.12	14,508
28	6	0.04	14,514
29	42	0.29	14,556
30	12	0.08	14,568
31	6	0.04	14,574
8/ 1	0	0.00	14,574
2	6	0.04	14,580
3	12	0.08	14,592
4	0	0.00	14,592

(Continued)

TABLE 4. (Continued)

Date	Daily Counts	Daily Percent of Total	Accumulated Counts
8/5	0	0.00	14,592
6	0	0.00	14,592
7	30	0.21	14,622
8	6	0.04	14,628
9	0	0.00	14,628
Totals	14,628	100.00	14,628

1/ Tower enumeration began on June 27, after river water conditions cleared sufficiently to permit observations.

TABLE 5. Nushagak River final chum salmon daily escapement counts, 1968.[1/]

Date	Daily Counts	Daily Percent of Total	Accumulated Counts
6/27	366	0.51	366
28	1,428	1.98	1,794
29	1,050	1.45	2,844
30	1,878	2.60	4,722
7/ 1	3,540	4.90	8,262
2	354	0.49	8,616
3	498	0.69	9,114
4	1,314	1.82	10,428
5	1,980	2.74	12,408
6	4,908	6.79	17,316
7	4,518	6.25	21,834
8	5,076	7.03	26,910
9	2,592	3.59	29,502
10	3,234	4.48	32,736
11	3,138	4.34	35,874
12	5,760	7.97	41,634
13	4,998	6.92	46,632
14	3,636	5.03	50,268
15	2,492	3.45	52,760
16	3,428	4.75	56,188
17	2,052	2.84	58,240
18	1,230	1.70	59,470
19	984	1.36	60,454
20	1,548	2.14	62,002
21	2,268	3.14	64,270
22	1,344	1.86	65,614
23	1,536	2.13	67,150
24	798	1.11	67,948
25	450	0.62	68,398
26	1,074	1.49	69,472
27	510	0.71	69,982
28	300	0.42	70,282
29	18	0.02	70,300
30	168	0.23	70,468
31	132	0.18	70,600
8/ 1	54	0.07	70,654
2	438	0.61	71,092
3	162	0.22	71,254
4	156	0.22	71,410

(Continued)

TABLE 5. (Continued)

Date	Daily Counts	Daily Percent of Total	Accumulated Counts
8/5	96	0.13	71,506
6	186	0.26	71,692
7	102	0.14	71,794
8	108	0.15	71,902
9	342	0.47	72,244
	72,244	100.00	72,244

1/ Tower enumeration.

TABLE 6. Nuyakuk River final pink salmon daily escapement counts, 1968.[1/]

Date	Daily Counts	Daily Percent of Total	Accumulated Counts
7/ 3	72	0.01	72
4	0	0.00	72
5	0	0.00	72
6	0	0.00	72
7	18	0.01	90
8	6	0.01	96
9	120	0.01	216
10	438	0.02	654
11	672	0.03	1,326
12	762	0.04	2,088
13	894	0.04	2,982
14	3,708	0.17	6,690
15	3,306	0.15	9,996
16	3,552	0.16	13,548
17	4,350	0.20	17,898
18	12,612	0.58	30,510
19	14,352	0.66	44,862
20	9,276	0.43	54,138
21	17,712	0.82	71,850
22	33,708	1.56	105,558
23	33,444	1.55	139,002
24	41,988	1.94	180,990
25	92,472	4.28	273,462
26	140,052	6.48	413,514
27	118,890	5.50	532,404
28	115,638	5.35	648,042
29	68,838	3.18	716,880
30	2,532	0.12	719,412
31	14,376	0.66	733,788
8/ 1	30,408	1.41	764,196
2	35,928	1.66	800,124
3	63,810	2.95	863,934
4	119,886	5.55	983,820
5	114,714	5.31	1,098,534
6	238,878	11.05	1,337,412
7	259,962	12.03	1,597,374
8	94,032	4.35	1,691,406
9	82,986	3.84	1,774,392
10[2/]	-18,960	-.88	1,755,432
11	25,764	1.19	1,781,196

(Continued)

TABLE 6. (Continued)

Date	Daily Counts	Daily Percent of Total	Accumulated Counts
8/12	28,650	1.32	1,809,846
13	41,430	1.92	1,851,276
14	2,040	0.09	1,853,316
15	31,512	1.46	1,884,828
16	29,556	1.37	1,914,384
17	30,342	1.40	1,944,726
18	37,812	1.75	1,982,538
19	33,072	1.53	2,015,610
20	38,178	1.77	2,053,788
21	29,004	1.34	2,082,792
22	36,540	1.69	2,119,332
23	17,460	0.81	2,136,792
24	12,726	0.59	2,149,518
25	9,912	0.46	2,159,430
26	1,686	0.08	2,161,116
Totals	2,161,116	100.00	2,161,116

1/ **Tower enumeration.**

2/ Negative counts result when the number of salmon moving downstream past the counting tower exceed the number of salmon migrating upstream past the tower during a given day. This phenomena occurs when salmon mill in the area of the counting tower.

TABLE 7. Stuyahok River final king salmon daily escapement counts, 1968.[1/]

Date	Daily Counts	Daily Percent of Total	Accumulated Counts
6/29	0	0.00	0
30	1	0.02	1
7/ 1	0	0.00	1
2	15	0.29	16
3	12	0.23	28
4	3	0.06	31
5	0	0.00	31
6	15	0.29	46
7	6	0.12	52
8	4	0.08	56
9	576	11.19	632
10	663	12.88	1,295
11	44	0.85	1,339
12	39	0.76	1,378
13	122	2.37	1,500
14	168	3.26	1,668
15	446	8.66	2,114
16	157	3.05	2,271
17	268	5.20	2,539
18	438	8.50	2,977
19	664	12.90	3,641
20	102	1.98	3,743
21	166	3.22	3,909
22	300	5.84	4,209
23	63	1.22	4,272
24	234	4.54	4,506
25	25	0.48	4,531
26	192	3.73	4,723
27	94	1.83	4,817
28	70	1.36	4,887
29	47	0.91	4,934
30	45	0.87	4,979
31	45	0.87	5,024
8/ 1	31	0.60	5,055
2	29	0.56	5,084
3	33	0.64	5,117
4	13	0.25	5,130
5	5	0.10	5,135
6	11	0.21	5,146
7	4	0.08	5,150
Total	5,150	100.00	5,150

1/ Weir enumeration.

TABLE 8. Stuyahok River final chum salmon daily escapement counts, 1968.[1/]

Date	Daily Counts	Daily Percent of Total	Accumulated Counts
6/29	0	0.00	0
30	2	0.02	2
7/ 1	0	0.00	2
2	0	0.00	2
3	4	0.04	6
4	11	0.11	17
5	1	0.01	18
6	156	1.53	174
7	208	2.04	382
8	501	4.93	883
9	516	5.08	1,399
10	464	4.57	1,863
11	491	4.83	2,354
12	391	3.84	2,745
13	684	6.73	3,429
14	617	6.07	4,046
15	538	5.29	4,584
16	421	4.14	5,005
17	500	4.92	5,505
18	629	6.19	6,134
19	411	4.04	6,545
20	178	1.75	6,723
21	290	2.85	7,013
22	351	3.45	7,364
23	238	2.34	7,602
24	229	2.25	7,831
25	217	2.14	8,048
26	337	3.32	8,385
27	230	2.26	8,615
28	283	2.78	8,898
29	144	1.46	9,042
30	194	1.91	9,236
31	172	1.69	9,408
8/ 1	153	1.51	9,561
2	123	1.21	9,684
3	137	1.35	9,821
4	120	1.18	9,941
5	119	1.17	10,060
6	82	0.80	10,142
7	21	0.20	10,163
Total	10,163	100.00	10,163

1/ Weir enumeration.

TABLE 9. Sex composition of Nushagak district king salmon commercial catch by period, 1968.

Period	No. of Samples	No. in Samples		Percent		Commercial Catch	No. in Catch	
		Males	Females	Males	Females		Males	Females
< 6/8	11	244	126	65.9	34.1	11,750	7,743	4,007
6/10-15	15	299	197	60.3	39.7	25,389	15,310	10,079
6/17-18	11	237	194	55.0	45.0	9,491	5,220	4,271
6/21 >	19	367	347	51.4	48.6	31,571	16,227	15,344
Weighted Totals	56	1,147	864	56.9	43.1	78,201	44,500	33,701

TABLE 10. Age composition of Nushagak district male king salmon commercial catch by period, 1968.

Period	No. of Samples	No. of Fish	Percent by Age Group[1/]										
			1.1	0.3	1.2	0.4	1.3	0.5	1.4	2.3	1.5	1.6	Total
			3_2	4_1	4_2	5_1	5_2	6_1	6_2	6_3	7_2	8_2	
< 6/8	11	209	-	1.0	1.0	0.4	56.0	-	37.8	-	3.8	-	100.0
6/10-15	15	259	0.4	1.9	5.4	1.9	54.4	-	31.7	0.4	3.5	0.4	100.0
6/17-18	11	204	-	2.0	4.9	1.0	52.4	-	33.8	0.5	5.4	-	100.0
6/21 >	19	300	2.0	2.7	21.7	-	37.0	0.6	32.0	-	3.7	0.3	100.0
Totals	56	972											
Weighted Percentages			0.9	2.1	10.5	0.8	48.1	0.2	33.1	0.2	3.9	0.2	100.0

1/ Top row is European system of age designation, while bottom row is Gilbert-Rich system.

TABLE 11. Age composition of Nushagak district female king salmon commercial catch by period, 1968.

Period	No. of Samples	No. of Fish	Percent by Age Group							Total
			0.3	0.4	1.3	0.5	1.4	1.5	2.4	
			4_1	5_1	5_2	6_1	6_2	7_2	7_3	
< 6/8	11	103	-	1.0	15.5	-	66.0	15.5	2.0	100.0
6/10-15	15	174	0.6	4.0	7.5	1.1	66.7	20.1	-	100.0
6/17-18	11	157	-	2.5	8.9	1.3	77.1	10.2	-	100.0
6/21 >	19	287	-	4.2	8.7	0.3	72.5	14.0	0.3	100.0
Totals	56	721								
Weighted Percentages			0.2	3.5	9.2	0.6	70.6	15.5	0.4	100.0

TABLE 12. Age composition of Nushagak district king salmon commercial catch by period, both sexes combined, 1968.

Period	No. of Samples	No. of Fish	Percent by Age Group											Total
			1.1	0.3	1.2	0.4	1.3	0.5	1.4	2.3	1.5	2.4	1.6	
			3_2	4_1	4_2	5_1	5_2	6_1	6_2	6_3	7_2	7_3	8_2	
< 6/8	11	312	-	0.7	0.6	0.6	42.6	-	47.1	-	7.7	0.7	-	100.0
6/10-15	15	433	0.2	1.4	3.2	2.8	35.6	0.5	45.7	0.2	10.2	-	0.2	100.0
6/17-18	11	361	-	1.1	2.8	1.7	33.5	0.5	52.6	0.3	7.5	-	-	100.0
6/21 >	19	587	1.0	1.3	11.1	2.0	23.2	0.5	51.8	-	8.7	0.2	0.2	100.0
Totals	56	1,693												
Weighted Percentages			0.5	1.2	6.0	2.0	31.4	0.4	49.2	0.1	8.9	0.2	0.1	100.0

TABLE 13. Sex composition of Nushagak district chum salmon commercial catch by period, 1968.

Period	No. of Samples	No. in Sample		Percent		Commercial Catch	No. in Catch	
		Males	Females	Males	Females		Males	Females
< 6/26	13	181	313	20.6	79.4	37,001	7,622	29,379
6/28-7/3	11	143	286	33.3	66.7	59,243	19,728	39,515
7/4 >	14	179	344	34.2	65.8	82,542	28,229	54,313
Weighted Totals	38	503	943	31.1	68.9	178,786	55,579	123,207

TABLE 14. Age composition of Nushagak district male chum salmon commercial catch by period, 1968.

Period	No. of Samples	No. of Fish	Percent by Age Group			Total
			0.2	0.3	0.4	
			3_1	4_1	5_1	
< 6/26	13	164	1.8	64.6	33.6	100.0
6/28-7/3	11	128	7.8	56.3	35.9	100.0
7/4 >	14	166	11.4	70.5	18.1	100.0
Totals	38	458				
Weighted Percentages			8.8	64.7	26.5	100.0

TABLE 15. Age composition of Nushagak district female chum salmon commercial catch by period, 1968.

Period	No. of Samples	No. of Fish	Percent by Age Group 0.2 3_1	0.3 4_1	0.4 5_1	0.5 6_1	Total
< 6/26	13	282	2.5	57.4	39.7	0.4	100.0
6/28-7/3	11	269	3.7	61.7	34.6	-	100.0
7/4 >	14	307	9.8	74.9	15.3	-	100.0
Totals	38	858					
Weighted Percentages			6.1	66.5	27.3	0.1	100.0

TABLE 16. Age composition of Nushagak district chum salmon commercial catch by period, both sexes combined, 1968.

Period	No. of Samples	No. of Fish	Percent by Age Group 0.2 3_1	0.3 4_1	0.4 5_1	0.5 6_1	Total
< 6/26	13	446	2.2	60.1	37.5	0.2	100.0
6/28-7/3	11	397	5.0	60.0	35.0	-	100.0
7/4 >	14	473	10.3	73.4	16.3	-	100.0
Totals	38	1,316					
Weighted Percentages			6.9	66.2	26.9	0.0	100.0

TABLE 17. Sex composition of Nushagak district chum salmon escapement, 1968.[1/]

Period	No. of Samples	No. in Sample		Percent		Escapement[2/]	No. in Escapement	
		Males	Females	Males	Females		Males	Females
6/29-8/7	13	353	142	71.3	28.7	10,163	7,246	2,917

1/ Spawning ground samples and escapement estimate from the Stuyahok River weir. Sex composition is not weighted.

2/ Note that this represents only a portion of the estimated 90-110,000 escapement of chum salmon to the total Nushagak system.

TABLE 18. Age composition of Nushagak district chum salmon escapement, 1968.[1/]

Period	No. of Samples	No. of Fish	Percent by Age Group			Totals
			0.2	0.3	0.4	
			3_1	4_1	5_1	
			MALES			
6/29-8/7	13	328	2.7	56.7	40.6	100.0
			FEMALES			
6/29-8/7	13	122	2.5	63.1	34.4	100.0
			SEXES COMBINED			
6/29-8/7	13	450	2.7	58.4	38.9	100.0

1/ Spawning ground age composition from Stuyahok River weir. Age composition is not weighted.

TABLE 19. Sex composition of Nushagak district pink salmon commercial catch by period, 1968.

Period	No. of Samples	No. in Samples		Percent		Commercial Catch	No. in Catch	
		Males	Females	Males	Females		Males	Females
< 7/20	8	250	36	87.4	12.6	606,004	529,647	76,357
7/21-27	10	299	59	83.5	16.5	823,537	687,653	135,884
7/28 >	1	297	120	71.2	28.8	275,609	196,234	79,375
Weighted Totals	19	846	215	82.9	17.1	1,705,150	1,413,534	291,616

TABLE 20. Sex composition of Nuyakuk River pink salmon escapement by period, 1968.

Period	No. of Samples	No. in Samples		Percent		Escapement	No. in Escapement	
		Males	Females	Males	Females		Males	Females
7/3-27	1	32	145	18.1	81.9	532,404	96,365	436,039
7/28	1	144	400	26.5	73.5	115,638	30,644	84,994
7/29-8/4	1	60	149	28.7	71.3	335,778	96,368	239,410
8/5 >	1	52	103	33.5	66.5	1,177,296	394,394	782,902
Weighted Totals	4	288	797	28.6	71.4	2,161,116	617,771	1,543,345

TABLE 21. Summary of sex composition of Nushagak district pink salmon commercial catch and escapement, 1968.

No. of Samples	No. in Samples		Percent		No. of Fish		
	Males	Females	Males	Females	Males	Females	Total
			CATCH				
19	846	215	82.9	17.1	1,413,534	291,616	1,705,150
			ESCAPEMENT[1/]				
4	288	797	28.6	71.4	617,771	1,543,345	2,161,116
			SEXES COMBINED				
23	1,134	1,012	52.5	47.5	2,031,305	1,834,961	3,866,266

1/ Sex ratio derived from sampling of Nuyakuk River escapement.

TOGIAK DISTRICT

The fishing area in the Togiak district remained similar to that of 1967, with the exception of elimination of two sections, Ungalikthluk and Nunavarchak, and the relocation of the Kulukak section outer boundary line (Figure 3). Of the five sections open to fishing in 1968, only three were fished all season: Togiak, Osviak, and Matogak, with the Togiak River section accounting for over 66 percent of the commercial catch (Table 22). Catch statistics were gathered only on the king and chum salmon fisheries.

King Salmon

The harvest of 13,499 king salmon was the largest in the 15-year history of the fishery, although comparable with last season's catch. Aerial survey estimates of the escapement indicated a spawning population of approximately 12-15,000 (Table 2). Appendix Table 2 lists king salmon escapements by river system.

Sex and age composition of the 1968 king salmon commercial catch are given in Tables 23 through 26. Average weight of 212 kings sampled randomly throughout the season was 25.4 pounds, and is presented in Appendix Table 4.

Chum Salmon

The chum salmon catch of 108,001 was the sixth largest in the 15-year history of the fishery, and was 18 percent higher than the average (1954-1968, Table 22). Over 41,000 chums were caught in the Osviak-Matogak sections, however, all catches and samples were grouped together when preliminary analysis indicated no changes in sex and age composition between areas.

As was the case in 1967, the red salmon return was poor and restricted fishing time allowed an excellent escapement of chums in the district. Extensive aerial surveys of the spawning grounds were flown in all of the important chum salmon producing systems in the Togiak district, and the total chum escapement was estimated to be 348,000 (Table 2). Appendix Table 3 lists the estimated chum escapement populations by river system along with a brief explanation of how the data was expanded to give total population estimate. The total estimated run, catch and escapement combined, was 456,000, the largest ever recorded in the district.

Tables 27 through 30 present sex and age composition of the 1968 chum salmon commercial catch. Average weight of 303 chums sampled throughout the season was 7.4 pounds and is compared with previous years in Appendix Table 4.

Figure 3. 1968 TOGIAK COMMERCIAL FISHING DISTRICT

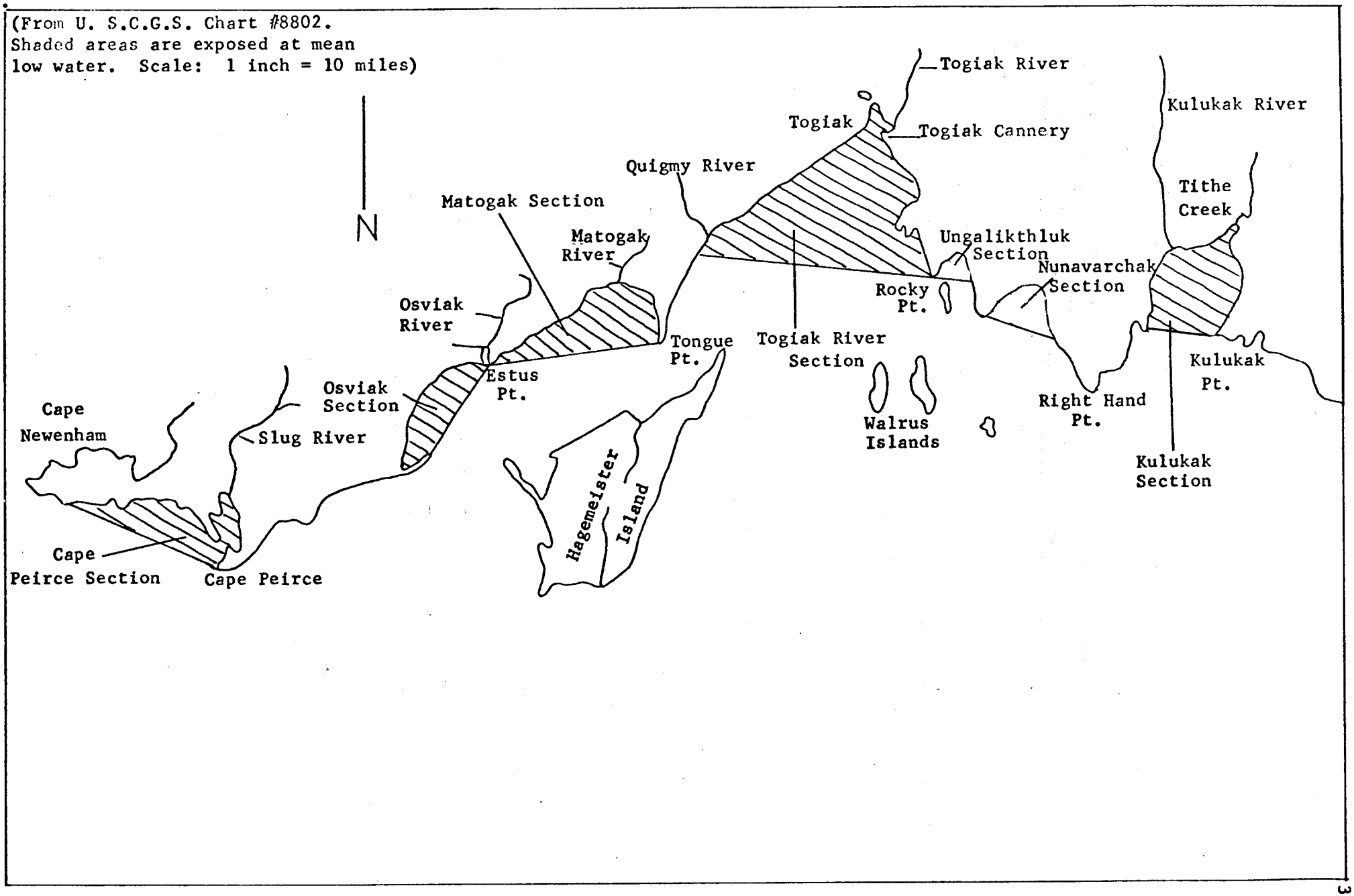


TABLE 22. Togiak district final commercial catch, other than red salmon, by species and period, 1968.

Period	Hours	Catch by Species				
		Kings	Chums	Pinks	Cohos	Total
6/10-14	4 days	1,064	4			1,068
6/17-21	4 days	3,560	230	4		3,794
6/24-29	5 days	5,666	15,587	359	1	21,613
7/1-6	5 days	2,047	29,040	558	2	31,647
7/8-13	5 days	772	27,446	801	0	29,019
7/15-20	5 days	295	18,919	2,441	0	21,655
7/22-27	5 days	79	14,161	4,187	19	18,446
7/29-8/3	5 days	12	2,614	3,393	58	6,077
8/5-10	5 days	0			63	63
8/12-17	5 days	4			2,472	2,476
8/19-24	5 days				8,228	8,228
8/26-31	5 days				8,632	8,632
9/2-7	5 days				5,397	5,397
Totals		13,499	108,001	11,743	24,872	158,115
Percent of District Catch		8.6	68.3	7.4	15.7	100.0

TABLE 23. Sex composition of Togiak district king salmon commercial catch by period, 1968.

Period	No. of Samples	No. in Sample		Percent		Commercial Catch	No. in Catch	
		Males	Females	Males	Females		Males	Females
6/10-21	16	300	231	56.5	43.5	4,624	2,613	2,011
6/24 >	9	90	24	78.9	21.1	8,875	7,002	1,873
Weighted Totals	25	390	255	71.2	28.8	13,499	9,615	3,884

TABLE 24. Age composition of Togiak district male king salmon commercial catch by period, 1968.

Period	No. of Samples	No. of Fish	Percent by Age Group								Total
			0.3 4_1	1.2 4_2	0.4 5_1	1.3 5_2	0.5 6_1	1.4 6_2	1.5 7_2	1.6 8_2	
6/10-21	16	258	1.2	10.9	0.4	32.9	2.3	32.9	17.5	1.9	100.0
6/24 >	9	83	-	67.5	-	19.3	-	8.4	4.8	-	100.0
Totals	25	341									
Weighted Percentages			0.3	52.1	0.1	23.0	0.6	15.1	8.3	0.5	100.0

TABLE 25. Age composition of Togiak district female king salmon commercial catch by period, 1968.

Period	No. of Samples	No. of Fish	Percent by Age Group 0.3 4_1	0.4 5_1	1.3 5_2	0.5 6_1	1.4 6_2	1.5 7_2	1.6 8_2	2.5 8_3	Total
6/10-21	16	195	-	1.0	4.1	3.1	39.5	50.3	1.5	0.5	100.0
6/24 >	9	23	4.3	-	4.4	-	60.9	30.4	-	-	100.0
Totals	25	218									
Weighted Percentages			2.1	0.5	4.2	1.6	49.8	40.7	0.8	0.3	100.0

TABLE 26. Age composition of Togiak district king salmon commercial catch by period, both sexes combined, 1968.

Period	No. of Samples	No. of Fish	Percent by Age Group 0.3 4_1	1.2 4_2	0.4 5_1	1.3 5_2	0.5 6_1	1.4 6_2	1.5 7_2	1.6 8_2	2.5 8_3	Total
6/10-21	16	453	0.7	6.2	0.7	20.5	2.6	35.7	31.6	1.8	0.2	100.0
6/24 >	9	106	1.0	52.8	-	16.0	-	19.8	10.4	-	-	100.0
Totals	25	559										
Weighted Percentages			0.9	36.8	0.2	17.5	0.9	25.3	17.7	0.6	0.1	100.0

TABLE 27. Sex composition of Togiak district chum salmon commercial catch by period, 1968.

Period	No. of Samples	No. in Sample		Percent		Commercial Catch	No. in Catch	
		Males	Females	Males	Females		Males	Females
6/10-29	12	95	140	40.4	59.6	15,821	6,392	9,429
7/1-13	9	152	196	43.7	56.3	56,486	24,684	31,802
7/15 >	5	81	119	40.5	59.5	35,694	14,456	21,238
Weighted Totals	26	328	455	42.2	57.8	108,001	45,532	62,469

TABLE 28. Age composition of Togiak district male chum salmon commercial catch by period, 1968.

Period	No. of Samples	No. of Fish	Percent by Age Group			Total
			0.2	0.3	0.4	
			3_1	4_1	5_1	
6/10-29	12	89	-	88.8	11.2	100.0
7/1-13	9	145	0.7	90.3	9.0	100.0
7/15 >	5	77	27.3	64.9	7.8	100.0
Totals	26	311				
Weighted Percentages			9.1	82.0	8.9	100.0

TABLE 29. Age composition of Togiak district female chum salmon commercial catch by period, 1968.

Period	No. of Samples	No. of Fish	Percent by Age Group 0.2 3_1	0.3 4_1	0.4 5_1	0.5 6_1	Total
6/10-29	12	133	0.8	79.7	18.8	0.7	100.0
7/1-13	9	190	2.1	86.8	11.1	-	100.0
7/15 >	5	115	13.0	80.9	6.1	-	100.0
Totals	26	438					
Weighted Percentages			5.6	83.7	10.6	0.1	100.0

TABLE 30. Age composition of Togiak district chum salmon commercial catch by period, both sexes combined, 1968.

Period	No. of Samples	No. of Fish	Percent by Age Group 0.2 3_1	0.3 4_1	0.4 5_1	0.5 6_1	Total
6/10-29	12	222	0.5	83.3	15.8	0.4	100.0
7/1-13	9	335	1.5	88.4	10.1	-	100.0
7/15 >	5	192	18.7	74.5	6.8	-	100.0
Totals	26	749					
Weighted Percentages			7.0	83.1	9.8	0.1	100.0

APPENDIX

APPENDIX TABLE 1. Peak aerial survey estimates of live king salmon in the Nushagak district, 1968.

Nushagak River Drainage			Mulchatna River Drainage		
Stream	Date	No. Fish	Stream	Date	No. Fish
Igushik River	7/8	100	Mulchatna River	8/6-7	1,710
Nushagak River	8/5	2,470	Stuyahok River	8/4	2,470
Muklung River	8/4	750	Old Man Creek	8/6	10
Iowithla River	8/4	850	Koktuli River	8/6	4,220
Klutuk Creek	8/6	130	Swan River	8/6	0
Nunachuak River	8/6	0	Mosquito Creek	8/6	340
Cranberry Creek	8/6	0	Keefer Creek	8/7	100
Napotoli Creek	8/7	0	Chilchitna River	8/7	120
Nuyakuk River	8/5	430	Chilikadrotna River	8/7	410
Harris Creek	8/5	0			
Klutispaw River	8/5	310			
Vukpalik Creek	8/5	50			
King Salmon River	8/5	1,000			
Chichitnok River	8/5	160			
Totals		6,250			9,380

APPENDIX TABLE 2. Peak aerial survey estimates of live king and coho salmon in the Togiak district, 1968.

King Salmon			Coho Salmon		
Stream	Date	No. Fish	Stream	Date	No. Fish
Togiak River	7/26	4,940	Togiak River	9/20	4,030
Gechiak Creek	7/26	800	Gechiak Creek	9/20	1,200
Pungokepuk Creek	7/26	330	Kashaiak River	9/20	200
Kashaiak River	7/26	400	Narogurum River	9/20	100
Narogurum River	7/26	540			
Ongivinuck River	7/26	450			
Ungalikthluk River	8/3	130			
Kukayachagak River	8/3	10			
Kulukak River	8/3	290			
Totals		7,890			5,530

APPENDIX TABLE 3. Aerial and total population estimates of live chum salmon in the Togiak district, 1968.

Stream	Date	Aerial Estimate	Times Factor 1/	Estimate of Total Population
Slug River	7/27	7,600	2.0	15,200
Pierce Creek	7/27	1,200	2.0	2,400
South Creek (Hag. Is.)	7/27	1,600	2.0	3,200
North Creek (Hag. Is.)	7/27	1,200	2.0	2,400
Osviak River	7/27	12,300	2.0	24,600
Matogak River	7/27	12,200	2.0	24,400
Quigmy River	7/27	2,200	2.0	4,400
Kurtluk River	7/27	100	2.0	200
Togiak River	7/26	109,300	1.5	164,000
Gechiak Creek	7/26	7,000	2.0	14,000
Pungokepuk Creek	7/26	4,300	2.0	8,600
Kashaiak River	7/26	14,100	2.0	28,200
Narogurum River	7/26	2,500	2.0	5,000
Ongivinuck River	7/26	5,300	2.0	10,600
Ungalikthluk River	8/3	1,700	3.0	5,100
Kukayachagak River	8/3	3,800	3.0	11,400
Right Hand Point Creek	8/3	500	3.0	1,500
Metervik Bay Creek	8/3	200	3.0	600
Kulukak River	8/3	7,400	3.0	22,200
Kanik River	7/26	0	2.0	0
Totals		194,500		348,000

1/ Since aerial spawning ground estimates are only a portion of the total spawning populations in a particular area, the factor applied to aerial counts to estimate the total population must accurately reflect conditions in each area surveyed. It is assumed that the wide, clear Togiak River offers a better chance to observe a larger portion of the total chum salmon population, hence a factor of 1.5 was used. The other streams, due to their smaller size and brush-covered shores offer less chance to observe spawning fish and a factor of 2.0 was used in these systems. A factor of 3.0 was used in 1968 in several systems to account for the lateness of the surveys. All factors used are in the opinion of the author, reasonable, and reflect a reliable estimate of the total chum salmon run in the areas surveyed.

APPENDIX TABLE 4. Average weight of king, chum, pink and coho salmon in the Nushagak and Togiak districts commercial catch, 1964-68.1/

Year	Nushagak District		Togiak District	
	Sample Size	Average Weight	Sample Size	Average Weight
		KING SALMON		
1964	258	14.7	39	15.9
65	347	20.1	257	21.8
66	796	18.3	147	20.7
67	971	21.0	32	21.3
68	558	22.2	212	25.4
		CHUM SALMON		
1964	-	-	14	7.0
65	74	6.1	188	6.8
66	44	8.6	442	7.5
67	447	6.6	265	7.0
68	462	6.9	303	7.4
		PINK SALMON		
1964	225	3.2	-	-
66	299	3.1	-	-
68	644	3.2	-	-
		COHO SALMON		
1964	39	6.8	-	-
66	399	7.5	-	-
67	473	7.0	-	-
68	129	7.6	-	-

1/ Unweighted arithmetic average.

APPENDIX TABLE 5. Fecundity, age, weight and length of king salmon from the Nushagak district commercial catch, 1966 and 1968.

Age Group		Sample Size	Mean Length	Mean Weight	Fecundity Range	Fecundity Mean
			1966			
1.3	5_2	5	784	18.5	8,222 - 9,270	8,578
1.4	6_2	22	881	27.0	6,362 - 16,049	10,379
1.5	7_2	4	972	31.3	7,666 - 11,559	11,559
	Totals	31	877	26.2	6,362 - 16,049	10,241
			1968			
1.3	5_2	5	769	17.9	5,302 - 9,916	8,138
1.4	6_2	24	887	26.6	7,383 - 14,668	10,225
1.5	7_2	9	974	34.4	10,915 - 14,607	12,506
	Totals	38	892	26.9	5,302 - 14,668	10,491

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If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information please write to ADF&G, P.O. Box 25526, Juneau, AK 99802-5526; U.S. Fish and Wildlife Service, 4040 N. Fairfax Drive, Suite 300 Webb, Arlington, VA 22203 or O.E.O., U.S. Department of the Interior, Washington DC 20240.

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